

# SCDOT Research Manual



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## 1.0 PURPOSE AND CONTEXT OF MANUAL

### 1.1 Background

The United States' first national highway program included research as one of its principal missions. Highway research is the oldest continuous Federal highway activity, having begun with the establishment of the Office of Road Inquiry in the Department of Agriculture in 1893. With the creation of this office, whose primary mission was to investigate the best methods of road making and to assist in disseminating this information, a formal, organized research program began.

The first sustained fiscal support for highway research was authorized by the Federal Highway Act of 1921. The enactment of the Hayden-Cartwright Act of 1934 laid the foundation for the Federal-Aid State Highway Planning and Research (HP&R) Program. Under this act, up to 1 ½ percent of highway funds apportioned to a State could be used for “surveys, plans, and engineering investigations.”

The Federal-Aid Highway Act of 1944 added the term “research” to the program which allowed States to use their 1 ½ percent allocation for a variety of research purposes. Funds not used for planning or research reverted to the construction program. The Federal-Aid Highway Act of 1962 required that the funds be used for planning and research purposes only, with the stipulation that they would lapse if not used within their availability period. The 1962 Act also gave States the option to use an additional ½ to 1 percent of their Federal-Aid primary and secondary system funds for planning and research activities.

The Federal-Aid Highway Amendments Act of 1963 incorporated “development” under planning and research, so this component could be an integral part of the overall R&D program and help stimulate States to take a more active role in the development phase.

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 retitled Highway Planning and Research (HPR) to State Planning and Research (SPR) and increased the set-aside of funds apportioned to States for SPR activities from 1 ½ percent to 2 percent. ISTEA also required that “a minimum of 25% of State Planning and Research (SPR) funds shall be expended on research, development and technology transfer activities.” Subsequent Acts have continued the minimum percentages of funding for research established by ISTEA.

### 1.2 Purpose

The primary purpose of this manual is to document the Department's research management process in accordance with federal requirements for use of SPR funds for RD&T activities. Also, the information in this manual should assist those not directly associated with research to better understand the process and increase involvement in the program.

### 1.3 Authority

The authority for the Department to administer the SPR funds in the research program is cited in 23 Code of Federal Regulations (CFR) 420, Subpart B. The authority for the Department to enter into agreements with institutes of higher education or consultants to conduct research or related studies is found in South Carolina Code of Law, Section 57-3-110. The Department's procedures for procurement and administration of federally funded research are outlined in Engineering Directive Memorandum (EDM) 55.

## 2.0 MISSION AND GOALS OF THE RESEARCH UNIT

### 2.1 Mission

The Research Unit handles the day-to-day operations of the research program. The Unit assists with fulfillment of the Department's mission and goals by conducting applicable research, disseminating information, and promoting national research programs.

### 2.2 Goals

The goals of the Research Unit are:

- perform and promote transportation-related research, technology transfer, and support activities;
- utilize all SPR funds made available for research and explore additional sources of funding as necessary to carry out the mission of the Unit;
- increase awareness of the research program among potential customers, both internal and external, to enhance interest and broaden the scope of the program;
- maximize involvement of personnel from all areas of the Department in the research program process;
- promote national programs and initiatives that support and enhance transportation research.



## 3.0 CUSTOMER SUPPORT DEVELOPMENT

### 3.1 Purpose

It is essential that potential customers be identified and their understanding and support secured for a successful and meaningful research program. This can be best achieved by involving customers in the process of developing the research program, including them on project committees, or by involving them in discussions for studies related to their areas of interest.

### 3.2 Process

#### 3.2.1 Research Partners

Research partners are usually representatives of the Department, other state and local agencies, universities, transportation related associations (i.e., SC Asphalt Pavement Association, Asphalt Institute, American Concrete Pavement Association, SC Mining Association), contractors, and the Federal Highway Administration (FHWA). The degree of involvement by research partners varies throughout the process as noted in this manual.

#### 3.2.2 Forums for Inclusion

##### 3.2.2.1 Requests for Research

Research topics are solicited from all research partners, and this process is discussed herein.

##### 3.2.2.2 Committees

Research partners may be represented on specific committees as defined under Research Committees in section 4.2. The purpose of the different committees, agendas, and meeting schedules are included in that discussion.

##### 3.2.2.3 Special Meetings

To identify partners and promote the intra-Departmental research program, members of the Research Unit will periodically meet with staff members of all major units in Headquarters and District Offices. These sessions will examine the scope of the research program and the needs of individual units that could possibly be addressed by research. The expertise and interest of individuals in the various units will be identified for possible involvement on research committees or in other activities related to the program.

Special meetings will be held, as appropriate, to involve research partners who could be affected by pending or ongoing research. These meetings will allow input on specific research issues and its impact on partner operations. These discussions should also foster support for implementation of findings and recommendations. This information will also be presented at various operations, committee, and general periodic meetings that involve research partners. These may include the Hot Mix Asphalt Quality Improvement Committee, Joint Association of General Contractors/Engineers Conference, SCDOT Engineers Conference, etc.

## 4.0 RESEARCH ORGANIZATION

### 4.1 Research Unit

The Research Unit administers the Department's research program. The Unit's tasks include, but are not limited to the following:

- providing documentation, reports, etc. to meet federal and state requirements;
- managing contracted research projects contained in the SPR Program;
- conducting staff research and directing staff activities for studies conducted in-house through the SPR or In-House Investigation Programs;
- managing the Department's New Products Program;
- coordinating research activities involved with national research programs such as USDOT, FHWA, AASHTO, TRB, NCHRP, and others;
- promoting research implementation;
- conducting technology transfer activities including monitoring activities of the Transportation Technology Transfer Service (T<sup>3</sup>S) at Clemson University.

The Research Unit is located at the Office of Materials and Research, which is part of the Construction Office in the Engineering Division. The Unit is supervised by the Research Engineer who reports to the Materials and Research Engineer.

### 4.2 Research Committees

Of all the activities that impact customer support, the work of research committees and their functions are probably most important. Through committee involvement, research staff formally maintains contact with the operating units of the Department and other entities. Non-research members of the committees are exposed to a formal interactive process which conscientiously solicits their participation and support.

Appropriately structured, these committees are useful in developing and updating research plans; providing input for the periodic solicitation of potential research problems; setting priorities for projects selected for the work program; giving advice and general guidance during the process of the project; and serving as important conduits for the transfer of research results.

#### 4.2.1 Research and Development Executive Committee

##### 4.2.1.1 Function

The Research and Development Executive Committee (RDEC) guides and directs the Department's research program. This Committee has overall responsibility for the operation of the Research Unit, including fiscal accountability; reviewing and prioritizing research topics for development as research projects; monitoring progress of on-going studies and implementation of results from completed studies. The research staff serves as support for the RDEC and makes regular progress reports and presentations at Committee meetings.

#### 4.2.1.2 Membership

Membership is composed of high-level managers from all major units in Headquarters, a representative from the Office of Materials and Research, two field representatives, and a representative from the FHWA. The makeup and organization of the Committee is shown below:

Chairman, Deputy Secretary for Engineering  
Secretary, Materials and Research Engineer  
Deputy Secretary for Intermodal Planning  
Deputy Secretary for Finance and Administration  
Chief Engineer for Operations  
Chief Engineer for Location and Design  
Chief Engineer for Field Operations  
Director of Construction  
Director of Environmental Management  
Director of Maintenance  
Director of Planning  
Director of Preconstruction  
Director of Right of Way  
Director of Traffic Engineering  
(2) District Engineering Administrators  
FHWA Representative

#### 4.2.1.3 Meeting Agenda

Agendas for RDEC meetings are prepared by the Research Unit. Agenda items are solicited from Committee members via the announcement for the meeting. The agenda will vary at meetings, but some typical subjects include:

- presentations by Principal Investigators on the status or findings of projects;
- discussions on implementation of findings;
- discussions of results of ballots for research topics and final prioritization for development as research projects;
- discussions and selection of pooled fund studies to participate in;
- updates on status of SPR Part II funds;
- briefings on items of interest by the FHWA representative.

#### 4.2.1.4 Meeting Frequency and Location

The Committee meets semiannually, usually in June and December. A special meeting to prioritize research topics obtained from the solicitation process described in section 5.1.2 may be held if timing does not coincide with a regular meeting. Meetings are usually held in the Department's Headquarters but if necessary, may be held at the Office of Materials and Research.

## 4.2.2 Project Steering and Implementation Committee

### 4.2.2.1 Function

The overall responsibility of a Steering and Implementation Committee is to provide guidance to the research project's Principal Investigator to ensure the needs of the Department are met. The Committee is usually formed when development of an approved topic as a study begins and continues through the implementation phase of the project. The Committee reviews the problem statement to ensure that it is stated correctly and is complete. The Committee selects the Principal Investigator in accordance with section 5.2.1. The Committee reviews and approves the proposal prepared by the Principal Investigator, monitors progress through project progress reports and meetings, and reviews and approves the final report prior to printing. The Committee also determines the need for contract modifications on research projects and reviews and approves proposals for the additional work. The Committee is responsible for follow-up on implementation of results.

### 4.2.2.2 Membership

Steering and Implementation Committees are usually composed of three to five Department engineers or professionals with expertise in the study topic and whose areas of responsibility are impacted by the research. An effort is made to include mid-level engineers and managers on the Committees with expertise in the subject matter and who have sufficient time to devote to the task. A representative from the FHWA also serves on each Committee. As appropriate, individuals from the private sector may be asked to serve on these Committees.

A chairperson is appointed for each Steering and Implementation Committee by the supervisor of the unit that proposed the study with approval of the appropriate Director or Deputy Secretary. A member of the Research Unit usually assists the chairperson in completing the membership of the Committee. In general, the chairperson acts as the Department's primary technical contact for the research project. Specific duties include but are not limited to: assisting the Principal Investigator by coordinating with other units to obtain data or information needed for the project; scheduling Steering and Implementation Committee meetings and preparing agenda with assistance from the Research Unit; making recommendations to the Committee on the need for and approval of time extensions and/or project modifications; and leading efforts on implementation of project findings.

### 4.2.2.3 Meeting Agenda

The agenda for Steering and Implementation Committee meetings vary depending upon the specific tasks to be accomplished. For example, the initial meetings usually involve finalizing the problem statement and items associated with selecting a Principal Investigator. A meeting to discuss a proposal could include a presentation by the Principal Investigator on the concept of the study and tasks included in the proposal. An open discussion with the Principal Investigator would also be included. Routine Committee meetings during the life of the study would include the following items as a minimum:

- a review of administrative details to include starting date, descriptions of any extensions, cost increases, current completion date, budget, and objectives;
- a presentation by the Principal Investigator on project status;
- discussion of problems encountered in the project, any concerns of the Committee, future direction of study, changes, etc.;
- discussion of implementation of results already obtained or possible implementation activities for foreseeable findings.

#### 4.2.2.4 Meeting Frequency and Location

The Committee chairperson is responsible for arranging and scheduling meetings, with assistance from the Research Unit, to finalize problem statements, review and discuss proposals, monitor the progress of projects, discuss final reports and findings, and initiate and pursue implementation. During the life of a project, meetings are held with the Principal Investigator at intervals necessitated by the work but at least every six months on short-term projects, duration of a year or so, and at least yearly for multiple year projects. After completion of the project, meetings will be held as needed to follow-up on implementation of findings.

Meetings are usually held at the Office of Materials and Research or Headquarters but may be scheduled at the work site, if possible, on projects with laboratory or fieldwork.

## 5.0 PROGRAM DEVELOPMENT

### 5.1 Problem Solicitation and Research Project Approval Process

#### 5.1.1 Purpose

Research topics are solicited, as described in section 5.1.2, for the RDEC's consideration for funding as studies in the SPR Research Program. The primary focus of the solicitation process is to identify research needs of SCDOT that are used in the development of the work program as well as topics for possible submission to NCHRP, TCRP, or other national programs.

#### 5.1.2 Solicitation Process

##### 5.1.2.1 Research Topic Solicitation Meeting

###### 1.1 Purpose and Frequency

The purpose of the one-day meeting is to increase awareness and understanding of the Department's research program among all its customers and to identify needs in the Department that can be addressed by research. The meeting is intended to serve as the primary topic solicitation. The meeting is held every two to two and one half years. However if circumstances warrant, the interval between solicitation meetings can be altered as deemed appropriate.

###### 1.2 Participants

The meeting usually includes participants from all areas of the Department, in-state universities, industry, trade organizations, and the FHWA. Prior to the meeting, personnel from the Research Unit meet with upper management in the different units in Headquarters to identify participants and the breakout group each will attend.

###### 1.3 Format

The meeting begins with a plenary session of all participants during which an overview of the research program is presented and the purpose of the meeting discussed. Each meeting participant then attends one of several breakout sessions as previously determined, each on a different subject area of potential research interest for the Department. The breakout sessions can vary from meeting to meeting but generally include subject areas such as:

- Construction/Materials
- Maintenance/Bridge Maintenance
- Traffic/Safety
- Preconstruction/Environmental
- Intermodal Planning/Business Operations

Research staff solicits topics from all research partners prior to the meeting. The topics are reviewed and separated by subject matter corresponding to the breakout groups. A moderator from the Office of Materials and Research is assigned to each breakout group. Since some groups are larger than others and topics are so varied, moderators have some discretion in how to handle their breakout session. However, the general format for each breakout group is to discuss the topics in that group during the morning session to ensure that all participants in the group understand what is intended by each proposed topic. Only Department and FHWA personnel participate in the afternoon session in which one or more voting techniques are used to identify the most important topics. Before completing the breakout session, a “champion” from the Department is identified for each of the higher priority topics. It is the champion’s responsibility to develop a problem statement for the topic.

The meeting concludes with another plenary session of all participants during which each moderator shares information on their breakout group’s activities and presents the higher priority topics resulting from their group. In closing, a timeline is provided to all participants that includes the date problem statements are due to the Research Unit and dates of milestones in the RDEC’s balloting and approval process.

#### 5.1.2.2 Problem Statements

The “champion” can obtain assistance in preparing a problem statement from anyone, either inside or outside the Department, as deemed appropriate. However, assistance in preparation of a problem statement by personnel associated with a university, consultant, or other entity interested in performing the research in no way obligates the Department to award the project to that university, consultant, or entity.

A problem statement form is sent electronically to all topic “champions” by a member of the research staff. A copy of the form, along with directions for completing the form, is included in Appendix 1. Completed problem statements are due approximately four weeks after the Research Topic Solicitation Meeting.

Upon receipt of problem statements, a member of the research staff will review each problem statement and if clarification or additional information is needed, the submitter is contacted. A literature search is conducted for each problem statement. Copies of the problem statements and literature search results are then forwarded to the appropriate Director/Deputy Secretary for their review and ranking in order of need.

### 5.1.3 Research Project Approval Process

#### 5.1.3.1 Balloting

Research staff prepares a ballot listing all problem statements received with a rating scheme from 0 to 5, with 0 indicating “no need” and 5 indicating “great need.” Problem statements are listed on the ballot by breakout group in the order ranked by the appropriate Director/Deputy Secretary. The ballot and copies of all problem statements, along with information obtained from the literature search, are sent to RDEC members. The Committee rates the problem statements with respect to the following:



- represents a current problem within the Department that needs researching;
- has high probability of success with implementable results beneficial to the Department;
- has anticipated results with a projected high rate of return for the Department;
- is there any completed or ongoing research on the specific problem, as identified by the literature search, with results that could be used directly by the Department.

Members are requested to return ballots to the Research Unit within a specified time, usually two to three weeks, depending on the number of problem statements on the ballot. The research staff will average the ratings for each statement and prepare a summary sheet to distribute to RDEC members for their review prior to the final prioritization meeting.

### 1.1 Final Prioritization Meeting

A meeting of the RDEC is held to discuss the results of the ballot and develop a final prioritized list of projects. Under normal circumstance, the balloting process is timed to allow the final prioritization meeting to be held at a regular scheduled RDEC meeting. The summary sheet for the ballot process, as described above, is distributed with the agenda to all members for their review prior to the meeting. Open discussions are held during this meeting, and anyone wishing to promote a particular project can be placed on the agenda to address the Committee. Projects can be moved up or down in priority at the discretion of the Committee.

A financial report detailing projected expenditures and funds available for the research program through the succeeding two fiscal years is also presented at this meeting. A final prioritized list is developed. Typically, fifteen to twenty projects are approved for funding but the number varies depending on availability of funds, perceived need, and estimated project funding levels. The final list is approved by the Committee. The list of approved projects is submitted to the Commission at the next succeeding meeting for information and is included in the SPR Part II Work Program submitted to the FHWA.

### 1.2 Scheduling of Approved Projects

Projects are developed over a two-year period within reasonable conformity to the prioritized order established by the RDEC unless circumstances warrant a change in priority of a project. Projects are developed as funds are available and budget limits permit.

#### 5.1.3.2 Process for Handling Projects Arising from Critical Needs

### 2.1 Project Criteria

It is anticipated that problems may arise requiring additional research not considered during the project solicitation meeting. These problems can arise from any area but their common element is the need to be addressed prior to the next solicitation.

National or regional pooled-fund studies being administered by others are also included in this category. Requests for participation in these studies are received at various times and often require a quick response. Handling these through the prioritization process for solicited topics would not be acceptable.

## 2.2 Procedures for Critical Needs Projects

### 2.2.1 Preparation of Project Description

Critical problems or projects that arise between solicitations are referred to the Research Unit. A problem statement is prepared in accordance with section 5.1.2.2 by a “champion” from the unit requesting the research and forwarded to the Research Unit along with any other information considered pertinent to explaining the proposed project or demonstrating need to the RDEC. The problem statement is reviewed by a member of the staff and if deemed necessary, forwarded to the research contact at the FHWA’s Division Office to ensure it is eligible for funding through the SPR Research Program. A literature search is also conducted.

### 2.2.2 Balloting Critical Needs Projects

The problem statement and other information are forwarded electronically, if possible, to all members of the RDEC along with a ballot to vote on the proposed project. Ballots may not be sent to the RDEC if the project arises near the time for a regularly scheduled meeting. Instead, the matter will be discussed and a vote taken at the meeting.

### 2.2.3 Scheduling Critical Needs Projects

Critical needs projects approved by the Committee usually proceed fairly quickly. However if approved projects remain on a prioritized list from a past solicitation, the RDEC can establish the priority for the critical needs project. Initiation of the projects is also dependent on availability of funds and adequate budget levels.

## 5.2 Project Development Process

The Research Unit is responsible for developing and administering approved projects. These projects can be conducted in-house or contracted out. This decision is made by the project Steering and Implementation Committee. Manpower and testing requirements of the proposed research project and the availability of Department in-house expertise in the subject area are usually the factors which determine these decisions.

## 5.2.1 Types of Research Projects

### 5.2.1.1 In-House Research Projects

SPR research projects can be conducted by any duly authorized Department employee. However, Office of Materials and Research staff often serves as Principal Investigators. In-house projects are usually small-scale studies which require little laboratory or field testing because of limited available manpower for extensive testing programs.

Principal Investigators for in-house projects are approved by the Steering and Implementation Committees. Report requirements, etc., are the same as for contracted SPR projects.

### 5.2.1.2 Contract Research with In-State Institutes of Higher Education

Several options are available to the Department for contracting research projects. The first option usually explored for outsourcing projects is that of contracting with an in-state institute of higher education due to their availability of expertise in a wide range of subject matter and experience performing research. This is beneficial to both parties because an in-state institute's lower overhead rate often allows performance of work at a lower cost to the Department and the institute's students benefit from the research experience.

Whenever possible, proposals for a project will be solicited from multiple institutes of higher education for consideration by the Steering and Implementation Committee. In this case, qualification based selection will be used for selecting Principal Investigators. Selection will utilize criteria that measure the expertise of the researcher, understanding of the problem, proposed research approach, implementation plan, and other criteria unique to the specific project. If expertise in the subject matter for an approved research project resides at only one in-state institute of higher education, the Committee will request a proposal and pursue developing the project with that institute. The research staff makes a special effort in the course of meetings, seminars, etc., to identify university faculty members with special or unique experience or expertise in areas of interest to the Department. The contracting process, including cost negotiations and development of the final proposal, is in accordance with section 5.2.2.

### 5.2.1.3 Contract Research with other State or Federal Agencies

If a Steering and Implementation Committee determines that a state or federal agency, such as United States Geological Survey (USGS), is best suited to conduct a research project due to their particular expertise, availability of specialized equipment required for a study, etc., the Committee will request a proposal and pursue developing the project with that government agency. The contracting process, including cost negotiations and development of the final proposal, is in accordance with section 5.2.2.

#### 5.2.1.4 Advertised Research Projects

If a Steering and Implementation Committee determines that the scope of the research may require specialized expertise or equipment not normally available in-house, at in-state institutes of higher education, or at other state or federal agencies, the Committee can request that the research project be advertised. Office of Materials and Research staff will determine if the procurement should follow the exempt or non-exempt process as identified in Departmental Directive 13. If exempt, procurement for the research project will follow the qualifications based process outlined in Departmental Directive 41. If non-exempt, procedures outlined in Departmental Directive 13 will be used for the procurement.

#### 5.2.1.5 In-House Investigation Studies

State funded studies are conducted under the In-House Investigation Program at the Office of Materials and Research. Studies conducted under the program are small-scale and require only limited laboratory and field testing. The studies are often product related. Periodically, these projects expand into SPR projects and require all applicable approvals. The program is guided by the In-House Investigation Committee composed of staff engineers from the Office of Materials and Research. The Materials and Research Engineer serves as chairperson of this Committee and the Research Engineer is secretary. Meetings are held biannually, usually in the spring and fall. Progress reports on active investigations are presented at these meetings by personnel assigned the studies and potential new projects are discussed.

#### 5.2.2 Contracting Process for SPR Projects

Engineering Directive Memorandum (EDM) 55 provides overall guidance for procurement and administration of federally funded research. A copy is included in Appendix 2. The process for contracting SPR projects is outlined in detail in “Contract Process for Federally Funded Research Agreements.” A copy is included in Appendix 3. The process for handling contract modifications is outlined in “Contract Process for Contract Modification to Federally Funded Research Projects.” A copy is included in Appendix 4.

SPR research projects are authorized and funds obligated by PR2. Research staff programs research projects through SCDOT’s Project Programming System (P2S). Based on the information entered in P2S, staff in the Obligation Management Office prepare the PR2 for a project and forward it to the FHWA’s Division Office for approval. Once approved and returned to the Department, the Accounting Unit enters the project in their system.

## 5.3 Work Program Requirements

### 5.3.1 Purpose

The SPR Part II Work Program describes all the proposed research activities with estimated costs. The work program covering two federal fiscal years is prepared by research staff in even numbered years and forwarded to the FHWA Division Office for approval.

### 5.3.2 Process

#### 5.3.2.1 FHWA Work Program Requirements

The requirements for administration of a State Planning and Research Program are contained in 23 CFR, Part 420. RD&T work program requirements are defined in section 420.207. They are as follows:

- (a) The State DOT's RD&T work program must, as a minimum, consist of a description of RD&T activities to be accomplished during the program period, estimated costs for each eligible activity, and a description of any cooperative activities including the State DOT's participation in any transportation pooled fund studies and the NCHRP. The State DOT's work program should include a list of the major items with a cost estimate for each item. The work program should also include any study funded under a previous work program until a final report has been completed for the study.
- (b) The State DOT's RD&T work program must include financial summaries showing the funding levels and share (federal, state and other sources) for RD&T activities for the program period. State DOT's are encouraged to include any activity funded 100 percent with State or other funds for information purposes.
- (c) Approval and authorization procedures in section 420.115 are applicable to the State DOT's RD&T work program.

#### 5.3.2.2 FHWA Conditions for Approval

The conditions for approval of FHWA planning and research funds for RD&T activities are found in 23 CFR section 420.209.

## 6.0 PROGRAM REPORTING

### 6.1 Project Level Reporting

The exchange of information, via clear, concise and complete project reports, is essential to the implementation of research findings. It is important that these reports detail the progress and accomplishments of research projects.

Proper reporting of the individual components, represented by the projects, enhances evaluation of the entire program.

#### 6.1.1 Reports

##### 6.1.1.1 Quarterly

Progress reports are prepared on a calendar quarterly basis using the Department's form. Reports are forwarded to the Research Unit by the Principal Investigator for distribution to project Steering and Implementation Committee members, the FHWA, and appropriate Department files. Quarterly progress reports must be received and approved by the Steering and Implementation Committee chairperson for a study prior to payment of the invoice for the corresponding quarter.

##### 6.1.1.2 Interim

Interim reports may be required on projects of duration of two to three years or greater, or on projects expected to produce significant accomplishments during the course of the research. The report details work to the interim point in time, significant accomplishments, implementation of results and expected results, impediments to the project, and plans to overcome impediments.

##### 6.1.1.3 Final

Steering and Implementation Committee members associated with the project should be made aware of the findings prior to receiving the final report. Also, a final presentation is made to the Steering and Implementation Committee by the Principal Investigator at the conclusion of the project if requested. However, the final report is necessary to transfer the technology to other operating units and the research community. The final report should include, but not be limited to, the following information:

- Title Page;
- Technical Report Documentation Page;
- Disclaimer;
- Acknowledgements;
- Table of Contents, List of Tables and List of Figures;

- Introduction, including a description of the problem and its significance to the Department's work;
- Work Plan, including the experimental research plan, data collection, description of sites and activities and an analysis of the data;
- Findings and Conclusions;
- Recommendations, based on findings and conclusions, and suggestions for additional research;
- Implementation Plan, defining the procedure to introduce results into practice;
- Footnotes and References;
- Appendices;
- Publication Cost Information Page.
  - Number of copies printed
  - Total printing cost
  - Cost per copy

In addition, a separate one-page executive summary is required. This summary will briefly describe the problem, project objectives, findings, and recommendations, as a minimum.

## 6.2 Program Level Reporting

The expenditure of public funds is subject to close scrutiny. After carefully selecting projects and developing the work program, the research effort must clearly follow defined procedures to ensure positive results. From an individual project basis, the results are very meaningful. Collectively, the results are important to the overall research program.

### 6.2.1 Reports

#### 6.2.1.1 Annual Report

The results of work during the year on individual studies and activities included in the work program are documented in the Research Annual Report. This report provides a general overview of the program, a breakdown of program and project funding, information pertaining to accomplishments in the emphasis areas identified for the year, brief descriptions of studies started during the year, and summaries of studies completed during the year.

## 6.3 Funding Adherence

### 6.3.1 Program Level

Federal funds are made available for the SPR Research Program as provided in 23 CFR section 420.107 that states, “a State DOT must expend no less than 25 percent of its annual SPR funds on RD&T activities.” The funds are set aside in an appropriation code for use on approved line items in the work program. Funds utilized and unused balances are closely monitored by research staff and compared with figures contained in the Federal Management Information System (FMIS).

Other means of funding research projects are available such as federal funds from other appropriations, pooled fund arrangements, private funds, and others. If other funding sources are used, detailed accounting procedures are utilized to ensure financial accountability.

### 6.3.2 Project Level

Budgets are established for each line item in the work program. All line items in the program are authorized and funds obligated by PR2. However, program funds must be available. In addition, there must be sufficient funds available in the research objective code in SCDOT’s budget for expenditures to be made on research projects regardless of the amount of SPR funds available.

Expenditures are tracked by the research staff for each line item. A database is maintained that summarizes budgeted amount, invoice amounts and dates paid, and account balance for each project.



## 7.0 RESEARCH PEER EXCHANGE

### 7.1 Purpose

The use of peer exchanges was established to provide state DOTs' the opportunity to examine, evaluate, and improve their research programs through a collaborative team of peers, experts, and others involved in the process. The requirement for peer exchange is included in 23 CFR section 420.209.

### 7.2 Process

The state highway agency hosting the peer exchange selects a team of members knowledgeable about state research programs to exchange information and best practices relating to their overall research program and management process or to examine more focused areas the host state identifies as needing improvement. The traditional peer exchange is held onsite in the host state and lasts two to three days. The team, usually four to five people, can include participants from other state research programs, FHWA staff, universities, or other relevant participants and at least one or two of the members should have participated on previous peer exchange teams. A team leader is appointed by the host state. The actual process of the exchange is at the discretion of the host state. Multistate and virtual peer exchanges are also allowed in accordance with FHWA's "Guide for Peer Exchanges," FHWA-HRT-10-48, dated June 2010.

### 7.3 Reports

The host state is responsible for preparing a written report of the exchange. Copies of the report are provided to participants and the FHWA Division Office, as a minimum. The report is also posted on the Research Unit's website.

### 7.4 Funding

Per FHWA requirements, the host state is responsible for travel costs incurred by peer exchange team members. SPR funds are utilized to reimburse these expenses.

## 8.0 TECHNOLOGY TRANSFER

### 8.1 Purpose

The crux of research efforts by the state lies in the application of its results. Technology transfer extends beyond the use of the results in one or two units that might be involved in the research. The information must be widely disseminated if its full potential is to be realized.

### 8.2 Process

Technology transfer is a team effort requiring active participation by many parties, both inside and outside the Department, including FHWA, TRB, NCHRP, AASHTO, professional and trade organizations, universities, vendors, and many more. The Research Unit is very active in the technology transfer process in the following ways:

- the results of the research projects are advanced for implementation;
- results of research projects are widely disseminated within the Department, the FHWA, to all states, and to industry, as applicable;
- during and after the completion of projects, the research staff schedules meetings, presentations, seminars, etc., as appropriate, to present details and findings of the research;
- results of research performed by other states or agencies are distributed to appropriate units within the Department;
- the research staff administers and monitors the Transportation Technology Transfer Service at Clemson University, part of the Local Technical Assistance Program (LTAP);
- a research web page is maintained that includes copies of summaries and final reports for completed research projects and highlights items of interest related to the Department's research program;
- information is provided to Research in Progress (RIP) and the Transportation Research International Documentation (TRID) databases as appropriate.

Feedback is very important in the process. Research staff talks to its customers at various meetings and other occasions to determine the usefulness of the information being provided and what other information could be useful.

# APPENDIX 1

Research Problem Statement Form

# SCDOT Research Program

## Research Problem Statement Form

**I. Problem Title:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**II. Research Problem Statement:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**III. Research Objectives and Deliverables:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**IV. Specific Results and Payoff Potential:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**V. Implementation:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**VI. Champion:**  
Name: \_\_\_\_\_ Title: \_\_\_\_\_ Phone: \_\_\_\_\_

## Outline for SCDOT Problem Statement Form

### **I. Problem Title**

A suggestion title, in as few words as possible.

### **II. Research Problem Statement**

A statement of the general problem or need explaining the background information on how the problem or need arose and its significance to the Department. (Why does this subject need to be studied?)

### **III. Research Objective and Deliverables**

A statement of the specific research objective, defined in terms of the expected final product, that relates to the research problem statement in Part II. Define specific tasks necessary to achieve the research objective. (What is the goal of the study and specific steps needed to obtain the goal?) List what deliverables would be expected at the end of study.

### **IV. Specific Results and Payoff Potential**

A statement of the expected specific results that would be recognized through achievement of the stated objectives and a statement of the potential payoff in terms of cost / benefit from the achievement of the project objectives should be given. (What results would be achieved and how would the results benefit the Department?)

### **V. Implementation**

A statement of how the project will be implemented including who (department, unit, personnel) will benefit from achieving the research objectives. (How will the results be used and who will benefit from this project?)

### **VI. Champion**

Submitter and specific detail, as applicable, on affiliation (i.e.: Department, unit, etc.)

# APPENDIX 2

Engineering Directive Memorandum (EDM) 55

**South Carolina Department of Transportation**  
**Engineering Directive Memorandum**

Number: 55

Primary Department: Construction

Referrals: 23 Code of Federal Regulations, Part 420  
23 United States Code  
43 United States Code  
48 Code of Federal Regulations, Federal Acquisition Regulation (FAR)  
49 Code of Federal Regulations, Parts 18 and 19  
Office of Management and Budget (OMB) Circular A-21  
Office of Management and Budget (OMB) Circular A-133  
Title 57, Code of Laws of South Carolina  
Chapter 63, South Carolina Code of Regulations  
Departmental Directive 13  
Departmental Directive 41  
SCDOT Research Manual

Subject: Procurement and Administration of Federally Funded Research

State Planning and Research (SPR) funds received by state DOTs are administered by the Federal Highway Administration (FHWA). A portion of these funds are set aside for use in research, development, and technology transfer (RD&T) activities in the SPR Part II Program. Federal guidelines for use of these funds, as outlined in 23 CFR 420.209, require state DOTs to establish a management process for identification and prioritization of RD&T activities to address transportation issues in their organizations.

In accordance with requirements for use of SPR funds for RD&T activities, SCDOT has developed a research management process that is documented in the SCDOT Research Manual. This process and manual were approved by SCDOT's Research and Development Executive Committee and the FHWA. Research topics will be solicited and projects selected for funding as outlined in the approved management process. The Deputy Secretary for Engineering will approve the prioritized list of selected projects. The list of approved projects will be submitted to the Commission at the next succeeding meeting for information and included in the SPR Part II Work Program submitted to the FHWA.

Research projects will be developed in the approved prioritized order. A Steering and Implementation Committee, composed of SCDOT personnel with expertise in the subject area as well as a representative from the FHWA, will be formed for each research project. This committee will select the principal investigator in accordance with the approved management process as defined in the SCDOT Research Manual. Whenever possible, proposals for a project will be solicited from multiple in-state institutes of higher education for consideration. Qualification based selection will be used for selecting principal investigators. Selection will

utilize criteria that measure expertise of the researcher, understanding of the problem, proposed research approach, implementation plan, and other criteria unique to the specific project. If expertise in the subject matter for an approved research project resides at only one in-state institute of higher education, the committee will request a proposal and pursue developing the project with that institute.

If a Steering and Implementation Committee determines that a state or federal agency, such as the United States Geological Survey (USGS), is best suited to conduct a research project due to their particular expertise, availability of specialized equipment required for a study, etc., the committee will request a proposal and pursue developing the project with that government agency.

Negotiations will be conducted after the principal investigator is selected and the approach to performing the research is agreed upon and finalized by the Steering and Implementation Committee and the principal investigator. Negotiation procedures are documented in the SCDOT Research Manual.

Once the proposal is finalized, Office of Materials and Research staff will prepare a Commission Agenda Transmittal Form requesting approval of the agreement for the research project and forward through appropriate channels for submission to the Commission. Once approved by the Commission, contracts will be executed by the Chief Engineer for Operations.

If a Steering and Implementation Committee determines that the scope of the research may require specialized expertise or equipment not normally available at institutes of higher education, the committee can request that the research project be advertised. Office of Materials and Research staff will determine if the procurement should follow the exempt or non-exempt process as identified in Departmental Directive 13. If exempt, procurement for the research project will follow the qualifications based process outlined in Departmental Directive 41. If non-exempt, procedures outlined in Departmental Directive 13 will be used for the procurement.

Administration of executed SPR research contracts will be handled at the Office of Materials and Research in accordance with the approved management process as outlined in the SCDOT Research Manual and in compliance with all state and federal requirements.

Approved by: John V. Walsh  
John V. Walsh, Deputy Secretary for Engineering

Effective Date: September 7, 2012



# APPENDIX 3

Contract Process for Federally Funded Research Agreements

## **CONTRACT PROCESS FOR FEDERALLY FUNDED RESEARCH AGREEMENTS**

[As detailed in EDM 55 (Revised 9/7/12) and the Research Manual (Revised 8/23/13)]

1. Identification of Research Topics and Approval of Projects
  - A. Research topics are identified in accordance with section 5.1.2 “Solicitation Process” in the Research Manual
  - B. Topics are approved for development as research projects by the Research and Development Executive Committee (RDEC) as outlined in section 5.1.3 “Research Project Approval Process”
  - C. The list of approved projects is submitted to the Commission for information and is included in the SPR Part II Work program submitted to the FHWA
2. Project Steering and Implementation Committee
  - A. A Steering and Implementation Committee is formed for each project as outlined in section 4.2.2, “Project Steering and Implementation Committee,” in the Research Manual
  - B. The Committee finalizes the problem statement and selects the principal investigator (PI)
  - C. The Committee provides guidance to the research project’s PI during the course of the project to ensure the needs of the Department are met
  - D. The Committee is responsible for implementation of findings
3. Contracting Research with In-State Institutes of Higher Education
  - A. Whenever possible, the Steering and Implementation Committee with assistance from Research Unit staff sends the problem statement to multiple in-state institutes of higher education to determine interest
  - B. The Committee meets with all interested faculty from the institutes to discuss the problem statement in detail, answer their questions pertaining to the intent of the study, and requests proposals be submitted to the Office of Materials and Research (OMR) in approximately 30 days depending on the complexity of the study
  - C. The Committee reviews the proposals received from the institutes and selects a PI based on a qualification based selection process
  - D. If expertise in the subject matter resides at only one in-state institute of higher education, the Committee requests a proposal and pursues developing the project with that institute
  - E. The Committee meets with the selected PI to finalize the proposal by adding, modifying, or removing tasks as appropriate, establishing final deliverables, and negotiating time and costs
  - F. Once the proposal is finalized, Research Unit staff requests an agreement from the Contracts Office and forwards three copies to the institute for signatures
  - G. When the institute returns the signed agreements, Research Unit staff prepares a Commission Agenda Transmittal Form requesting approval and forwards it along with the agreements to the Contracts Office for submission through channels to the Commission
  - H. Once approved by the Commission, the three copies of the agreement are executed by the Chief Engineer for Operations and forwarded through the Contracts Office to the Office of Materials and Research
  - I. Research Unit staff contacts the PI and the Chairperson of the project’s Steering and Implementation Committee to determine a suitable start date then, based on the start date and duration of the project, enters the completion date in the agreement
  - J. Research Unit staff forwards one copy of the executed agreement to the institute by letter that includes the start date and completion date for the project, one copy to the Contracts Office for their file, and retains one copy for the official project file

4. Contracting Research with other State or Federal Agencies
  - A. If the Steering and Implementation Committee determines that a state or federal agency, such as USGS, is best suited to conduct a research project due to particular expertise, availability of specialized equipment required for a study, etc., the Committee will request a proposal and pursue developing the project with that government agency
  - B. The Committee meets with the PI to finalize the proposal by adding, modifying, or removing tasks as appropriate, establishing final deliverables, and negotiating time and costs
  - C. Once the proposal is finalized, Research Unit staff requests an agreement from the Contracts Office and forwards three copies to the agency for signatures
  - D. When the agency returns the signed agreements, Research Unit staff prepares a Commission Agenda Transmittal Form requesting approval and forwards it along with the agreements to the Contracts Office for submission through channels to the Commission
  - E. Once approved by the Commission, the three copies of the agreement are executed by the Chief Engineer for Operations and forwarded through the Contracts Office to the Office of Materials and Research
  - F. Research Unit staff contacts the PI and the Chairperson of the project's Steering and Implementation Committee to determine a suitable start date then, based on the start date and duration of the project, enters the completion date in the agreement
  - G. Research Unit staff forwards one copy of the executed agreement to the agency by letter that includes the start date and completion date for the project, one copy to the Contracts Office for their file, and retains one copy for the official project file
5. Advertised Research Projects
  - A. If the Steering and Implementation Committee determines that the scope of the research requires specialized expertise or equipment not normally available at in-state institutes of higher education or other state or federal agencies, the Committee can request that the project be advertised
  - B. Research Unit staff will proceed with advertisement in accordance with section 5.2.1.4, "Advertised Research Projects," in the Research Manual

# APPENDIX 4

Contract Process for Contract Modification to Federally Funded  
Research Projects

## **CONTRACT PROCESS FOR CONTRACT MODIFICATION TO FEDERALLY FUNDED RESEARCH PROJECTS**

1. Contract Modifications for Federally Funded Research projects
  - A. The need for a contract modification on a research project is determined by the Steering and Implementation Committee
  - B. The Committee meets with the Principal Investigator (PI) to discuss the additional work and requests a modified proposal
  - C. The Committee reviews the proposal and requests any additions or modifications to the tasks, deliverables, time, or cost of the additional work as appropriate
  - D. Once the proposal is finalized, Research Unit staff requests a contract modification from the Contracts Office and forwards three copies to the PI's organization for signatures
  - E. When signed contract modifications are returned, Research Unit staff prepares a Commission Agenda Transmittal Form requesting approval and forwards it along with the contract modifications to the Contracts Office for submission through channels to the Commission
  - F. Once approved by the Commission, the three copies of the contract modification are executed by the Chief Engineer for Operations and forwarded through the Contracts Office to the Office of Materials and Research
  - G. Research Unit staff forwards one copy of the executed contract modification to the PI's organization by letter that includes the new completion date and additional cost for the project, one copy to the Contracts Office and retains one copy for the official project file